

1988 GYPSY MOTH INTEGRATED PEST
MANAGEMENT PROGRAM ACTIVITIES

CATOCTIN MOUNTAIN PARK
THURMONT, MARYLAND

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BACKGROUND

In 1986, an intensive gypsy moth monitoring/IPM program was initiated at Catoctin Mountain Park. The objective of the program was to increase monitoring efforts at CMP in order to track gypsy moth population build-up and to initiate and evaluate tactics that show promise in low level population management prior to the occurrence of widespread defoliation.

The 500 meter grid system now includes 89 grid points at which male moth trapping and egg mass surveys are conducted annually. Burlap banding is also conducted at selected grid points to monitor pupae and larvae. In 1987-88, three pheromone-impregnated luretape areas were established and monitored to evaluate low level population management.

As a result of the monitoring activities, areas within the Park have been selectively chosen to suppress rising gypsy moth populations. To date, the treatments have all been by means of an aerial application of the microbial insecticide Bacillus thuringiensis (B.t.). Although wide-spread defoliation has been prevented, gypsy moth populations continue to rise and intervention actions are again being planned for 1989.

INTERVENTION ACTIVITIES

Suppression Project

In 1988, three spray blocks consisting of approximately 2260 acres were treated with two applications of B.t. (Figure 1.). The largest treatment block was approximately 1320 acres in size. This treatment block contained the Naval Support Facility and adjacent portions of CMP, and a large area south of Park Central Road which included Greentop Campground. The southeastern treatment block was 900 acres in size and encompassed a good portion of the park southeast of the Thurmont Vista parking lot. The final treatment area consisted of approximately 40 acres around Misty Mount Campground.

On May 22 and 23, 1988, all three of the treatment areas were treated with the first application of B.t. On May 26, all three of the treatment areas received a second application. Both treatments were applied by Helicopter Applicators, Inc. of Myersville, MD and a complete summary of the suppression activities is available (Schneeberger, 1988). Table 1 compares the pre- and post-treatment egg mass counts of grid points within the treatment areas. A report on the post-treatment egg mass survey results is available (see Gypsy Moth Egg Mass Survey Report, 12/9/88).

Disparlure Treatment Evaluation

In April of 1987, three 32 acre study areas (Figure 2) were identified for purposes of evaluating Luretape, a product available for low-level gypsy moth population management by means of mating disruption. The blocks were established in areas comprised of predominantly oak, and where resident gypsy moth populations were estimated to be relatively low based on the 1986 grid point egg mass survey data. Once established, each study block was intensively surveyed using thirty randomly distributed 1/40th acre fixed radius plots to more accurately describe pre-treatment resident gypsy moth populations. Pre-treatment egg mass counts ranged from 3-21 egg masses/acre (Table 3). Within each block, plastic disparlure disruptant dispensers impregnated with 249 mg disparlure per 1.5 x 2 inch dispenser were deployed at 10 meter intervals at the rate of approximately 20 grams per acre. These blocks were re-evaluated again in 1988 since the luretape is active for at least two years.

Monitoring of larvae and pupae was conducted in both 1987 and 1988. Ten oak trees (chestnut, black, or white) were banded in each luretape block. The bands were monitored weekly for six weeks beginning on June 2 and ending on July 6. Pupae and larvae were counted, then destroyed. The 1987-88 banding results within the luretape blocks are presented in Table 2. No significant changes were observed between the two years data.

In 1987-88, (post-treatment) egg mass surveys were conducted using the same methods and at the same intensity previously mentioned. A comparison of pre- and post-treatment egg mass results is presented in Table 3. The 1988 (2nd year post-treatment) egg mass counts increased an average of 224 percent from 1987 and 5738 percent over pre-treatment levels. During that same time period, park-wide egg mass counts increased 1272 percent.

The success of mating was evaluated by means of collecting 15 egg masses in 1987 and again in 1988 from each of the luretape study areas and 15 from a non-treated area. The egg masses were placed in petri dishes, reared at the Morgantown Entomology Laboratory and monitored for larval emergence. The results of the 1987 collection showed no significant difference (less than 2%) in egg mass fertility between the treated and non-treated collections (see Gypsy Moth IPM Program Activities Report, Catoctin Mountain Park-1987). The results of the 1988 egg mass collections are still pending.

DETECTION ACTIVITIES--1988

Defoliation Survey

The defoliation survey results were obtained through the interpretation of the 1:12,000 scale 9" by 9" color imagery taken on the June 25, 1988 photo mission. Approximately 19 acres of moderate defoliation (31-60 percent) occurred at CMP during this past summer (Figure 3.). Approximately 7 acres of that defoliation occurred within the southeastern treatment block.

MONITORING ACTIVITIES--1988

Larval and Pupal Monitoring

In addition to the larvae and pupae observations made within the luretape blocks (Table 2.), monitoring of larvae and pupae was conducted by banding 5 oak trees (chestnut, black, or white) at selected grid points. Six of these grid points were within the B.t. treatment blocks and four of the grid points were outside of the spray blocks. Each grid point (sample site) was checked weekly for 6 weeks beginning June 2 and ending on July 6. Pupae and larvae were counted and then destroyed. The results are presented in Table 4. The grid points within the treatment blocks had fewer larvae and pupae than those grid points in untreated areas even though they had 633 percent more egg masses per acre in 1987.

Male Moth Trapping

The standard milk carton trap was deployed at 85 of the grid points in May or early June. Each trap was checked three times, the last check being in the middle to late August. When a trap was checked, the male moths were counted and discarded. Some of the traps were disturbed by small mammals and dermestid beetles so estimates were necessary. These estimates were based on the number of wings found. Figure 4 shows the grid point locations and the number of male moths caught at each location. Male moth catches ranged from 95 to 2099 and averaged 962 per trap. The average catch per trap increased 53 percent from the 1987 average of 628 moths per trap. Approximately 81 percent of the traps deployed in 1988 caught more male moths than in 1987. A comparison of the 1987-88 cumulative male moth catch is presented in Table 5.

Egg Mass Counts

Egg mass surveys using 1/40th acre fixed-radius plots were conducted at 89 grid points from September to December, 1988. Table 6 presents a comparison of 1987-88 egg mass counts for each grid point. Figure 5 shows the grid point locations along with the egg mass counts at each grid point. Egg mass counts at the grid points ranged from 0-2480 and averaged 146 egg masses per acre. Egg masses were detected on 49 percent of the plots in 1988 compared to 44 percent in 1987. Fifteen percent of plots in 1988 have egg mass counts which exceed the commonly used defoliation threshold of 250 egg masses per acre. (That percent was the same in 1987.) For illustration purposes, Figure 6 presents a comparison of the percentage of plots within each egg mass density category for 1987 and 1988.

In addition to the egg mass surveys conducted at each grid point, 34 five-minute walks were conducted in high use areas or in areas where large numbers of egg masses had been noticed. Egg mass densities from these five-minute walks ranged from 76-5632 and averaged 1242 egg masses per acre. The area that had the highest counts is located north of Owens Creek Campground near grid point E-3. The five-minute walks in this area averaged 2848 egg masses per acre.

Using egg mass survey data obtained from both the grid points and five-minute walks, park-wide egg mass densities range from 0-5632 per acre and average 453 per acre. Egg mass densities increased 134 percent over the 1987 average of 193 egg masses per acre.

Egg mass densities within the 1988 treatment areas decreased by 36 percent in the Naval Support Facility treatment block, 59 percent in the Misty Mount block, and 80 percent in the southeastern spray block from pre-treatment counts. Egg mass counts in each of these treatment blocks now average 148, 128, and 167 egg masses per acre, respectively.

DISCUSSION

Most of the primary tasks outlined in the 1988 work plan were accomplished. The hazard rating of the eleven grid points added in 1987, however, was not completed. The low altitude color infrared photo imagery obtained this year proved to be useful for evaluating gypsy moth caused tree defoliation but the 1:12,000 scale was not adequate for cover type mapping as was planned. Hopefully, the 1989 photo mission with a scale of 1:6,000 will serve this purpose.

The Catoctin Mountain Park gypsy moth suppression project successfully provided foliage protection on approximately 99.7 percent of the area treated. Considering the widespread defoliation that occurred this year on neighboring state and private lands, the treatment effect was striking. Treatment effect on gypsy moth populations were first noted during the larvae/pupae surveys in treated vs. non-treated areas. Although pre-treatment population levels were much higher in the spray blocks, fewer larvae and pupae were observed in the treated areas than were the non-treated areas. Post-treatment egg mass counts supported this observation as an average population reduction of about 58 percent occurred within the treatment areas. Taking into account the heavy rainstorm that occurred within 12 hours following the first application and the less than desirable larval development that existed during the second application (36 percent 3-4th instar), the treatment effect proved to be surprisingly good.

The results of the 2-year luretape evaluation proved to be rather discouraging. Gypsy moth egg mass densities increased from averages ranging from 3-21 to averages of 301-619 egg masses per acre in the three areas evaluated. Although the rate of success of egg fertility is still pending for the second year post-treatment, the first year post-treatment results showed no significant differences. It is apparent that under the conditions that exist at CMP, this technique is not effective for low-level gypsy moth population management.

The results of this year's egg mass survey data indicate that gypsy moth populations are sufficient to cause heavy defoliation in portions of CMP in 1989. The heaviest populations are located in four general areas of the Park:

- 1) North of Owens Creek Campground
(approximately 1613 egg masses per acre);

- 2) East of Owens Creek Picnic Area
(approximately 1068 egg masses per acre);
- 3) Southeast of Round Meadow
(approximately 606 egg masses per acre);
- 4) North of Route 77 between Cunningham Falls and the Visitor Center
(approximately 649 egg masses per acre);

Because of the distance between grid points, adequate population estimates would not have occurred had we relied on the grid point data alone. As what took place during this year's egg mass survey, the importance of continued observations and identifying "hot-spots" while transversing between each point cannot be emphasized enough. Everyone involved during this year's egg mass survey should be commended for their observance of areas where more intensive surveys were needed.

References

- Onken, B.P. and R. Whiteman. 1987. 1987 Gypsy Moth Integrated Pest Management Program Activities, Catoctin Mountain Park. Office Report. February 1988.
- Onken, B.P. Gypsy Moth Egg Mass Survey Results, Catoctin Mountain Park, Thurmont, Maryland. Office Report. December 1988.
- Onken, B.P., N.F. Schneeberger, R. Steintl, and J. Sherald. IPM for Gypsy Moth, Catoctin Mountain Park. 1988 Work Plan. May 1988.
- Schneeberger, N.F. 1988. Summary Report of 1988 Gypsy Moth Suppression Activities, Catoctin Mountain Park and Naval Support Facility, Thurmont, Maryland. Office Report. September 1988.

Table 1.-- Pre-and Post-Treatment Egg Mass Counts by Grid Point for B.t.
Treatment Blocks at Catoctin Mountain Park, 1988.

Spray Block	Grid Point	Pre-Treatment EM/Acre	Post-Treatment EM/Acre
Eastern Block	J-11	0	0
Eastern Block	J-12	160	120
Eastern Block	K-11	40	0
Eastern Block	K-12	320	80
Eastern Block	K-13	1840	160
Eastern Block	L-12	40	0
Eastern Block	L-13	1680	600
Eastern Block	L-14	2080	640
Eastern Block	M-12	0	0
Eastern Block	M-13	960	320
Eastern Block	M-14	3640	200
Eastern Block	N-13	120	40
Eastern Block	O-13	40	0
Misty Mount Block	J-10	0	0
Misty Mount Block	K-10	0	40
Camp David Block	F-7	720	200
Camp David Block	F-8	80	200
Camp David Block	G-7	0	0
Camp David Block	G-8	0	0
Camp David Block	H-7	0	0
Camp David Block	H-8	40	40
Camp David Block	I-5	40	0
Camp David Block	I-6	80	80
Camp David Block	J-4	0	0
Camp David Block	J-5	1440	640
Camp David Block	J-7	0	40
Camp David Block	J-8	160	160
Camp David Block	K-5	440	240
Camp David Block	K-6	520	360
Camp David Block	K-7	0	0
Camp David Block	L-6	0	0

Table 2.-- Comparison of 1987-88 Total Number of Larval/Pupae Observed in Luretape Treatment Areas, Catoctin Mountain Park.

Sample Site*	Total # of Larvae	Total # of Pupae	Year
Block #1	2609	350	1987
Block #2	1023	192	1987
Block #3	2258	457	1987
Block #1	2230	335	1988
Block #2	1744	212	1988
Block #3	2010	450	1988

Percent change in number of larvae observed from 1987 to 1988 = +1.5%
 Percent change in number of pupae observed from 1987 to 1988 = -0.2%

*Total of ten trees banded in each sample site.

Table 3.-- Comparison of First and Second Year Post-Treatment Egg Mass Counts in the Luretape Blocks, Catoctin Mountain Park, 1987-88.

Area	Pre-Treatment (EM/Acre)	First Year Post-Treatment (Egg Masses Per Acre)	Second Year Post-Treatment (Egg Masses Per Acre)	Increase Over 2 Years
Block #1	11	151	493	226% 45-fold
Block #2	3	91	301	231% 100-fold
Block #3	.21	196	619	216% 29-fold

Table 4.-- Comparison of the Total Number of Larvae/Pupae Observed at Grid Points In and Outside of Treatment Areas, Catoctin Mountain Park, 1988.

Sample Site*	Total # of Larvae	Total # of Pupae	Treatment
J-5	590	21	Treated
J-8	30	0	Treated
J-10	334	5	Treated
L-12	242	21	Treated
M-12	10	0	Treated
N-13	417	60	Treated
L-11	25	0	Untreated
M-11	773	46	Untreated
N-11	798	171	Untreated
N-12	165	27	Untreated

Average number of larvae per sample site in treated areas = 271

Average number of larvae per sample site in untreated areas = 440

Average number of pupae per sample site in treated areas = 27

Average number of pupae per sample site in untreated areas = 61

*Total of five trees banded at each sample site.

Table 5.-- Comparison of 1987-88 Male Moth Catches by Grid Point,
Catoctin Mountain Park.

Grid Point	Number of Moths 1987	Number of Moths 1988	Trend
C03	145	592	+
C04	309	886	+
D02	367	1059	+
D03	742	1605	+
D04	863	928	+
E01	*	1117	
E02	430	442	+
E03	1725	1820	+
E04	*	910	
E05	37	540	+
F01	429	1007	+
F02	393	1599	+
F03	41	261	+
F04	784	831	+
F05	24	133	+
F06	*	1137	
F07	*	*	
F08	1521	1359	-
G02	666	1988	+
G03	130	718	+
G04	1282	912	-
G05	1189	1550	+
G06	*	1490	
G07	522	653	+
G08	609	837	+
H02	337	729	+
H03	713	675	-
H04	396	608	+
H05	347	840	+
H06	*	*	
H07	597	415	-
H08	512	603	+
I02	595	737	+
I03	1042	771	-
I04	612	634	+
I05	1372	660	-
I06	258	702	+
I08	838	95	-
I09	1559	2099	+
I10	912	1278	+
I11	*	1295	
J02	432	952	+
J03	380	293	-
J04	1684	802	-

Table 5. (continued)

Grid Point	Number of Moths 1987	Number of Moths 1988	Trend
J05	418	538	+
J07	675	302	-
J08	586	679	+
J09	536	1742	+
J10	634	963	+
J11	714	648	-
J12	*	1599	
K04	1326	1418	+
K05	146	1224	+
K06	1906	336	-
K07	672	617	-
K08	628	971	+
K09	734	1175	+
K10	339	215	-
K11	646	280	-
K12	*	1667	
L04	368	795	+
L05	342	1064	+
L06	606	732	+
L07	803	1238	+
L08	530	1025	+
L09	203	1178	+
L10	318	1160	+
L11	695	673	-
L12	805	996	+
L13	*	1327	
L14	*	1195	
M04	575	1198	+
M05	245	1418	+
M06	198	625	+
M07	139	1082	+
M08	265	1003	+
M09	383	976	+
M10	183	910	+
M11	528	1193	+
M12	602	659	+
M13	*	1278	
M14	*	1186	
N11	506	1338	+
N12	660	886	+
N13	835	1188	+
O12	*	1100	
O13	*	1442	

*Male Moth Traps Not Deployed

Trap catches increased in 81% of the traps deployed in both 1987-88.

Table 6.-- Comparison of 1987-88 Egg Mass Counts by Grid Point.
Catoctin Mountain Park.

Grid Point	Number of Egg Masses/Acre 1987	Number of Egg Masses/Acre 1988
C03	0	0
C04	0	40
D02	40	0
D03	560	920
D04	0	0
E01	120	120
E02	0	0
E03	40	520
E04	0	360
E05	80	200
F01	0	0
F02	40	0
F03	0	0
F04	0	40
F05	120	280
F06	40	120
F07	720	200
F08	80	200
G02	0	0
G03	0	120
G04	0	0
G05	0	0
G06	0	0
G07	0	0
G08	0	0
H02	0	0
H03	0	0
H04	0	0
H05	0	0
H06	0	0
H07	0	0
H08	40	40
I02	0	0
I03	0	0
I04	0	0
I05	40	0
I06	80	80
I08	0	0
I09	160	720
I10	40	80
I11	0	0
J02	240	0
J03	80	0
J04	0	0

Table 6. (continued)

Grid Point	Number of Egg Masses/Acre 1987	Number of Egg Masses/Acre 1988
J05	1440	640
J07	0	40
J08	160	160
J09	200	120
J10	0	0
J11	0	0
J12	160	120
K04	40	80
K05	440	240
K06	520	360
K07	0	0
K08	0	0
K09	0	80
K10	0	40
K11	40	0
K12	320	80
L04	0	80
L05	0	200
L06	0	0
L07	320	1080
L08	40	2480
L09	0	40
L10	0	160
L11	120	0
L12	40	0
L13	1680	600
L14	2080	640
M04	0	40
M05	0	160
M06	0	0
M07	0	0
M08	0	0
M09	0	0
M10	0	0
M11	0	40
M12	0	0
M13	960	320
M14	3640	200
N11	0	0
N12	40	120
N13	120	40
O12	0	0
O13	40	0

Figure 1.--1988 Treatment Areas at Catoctin Mountain Park.

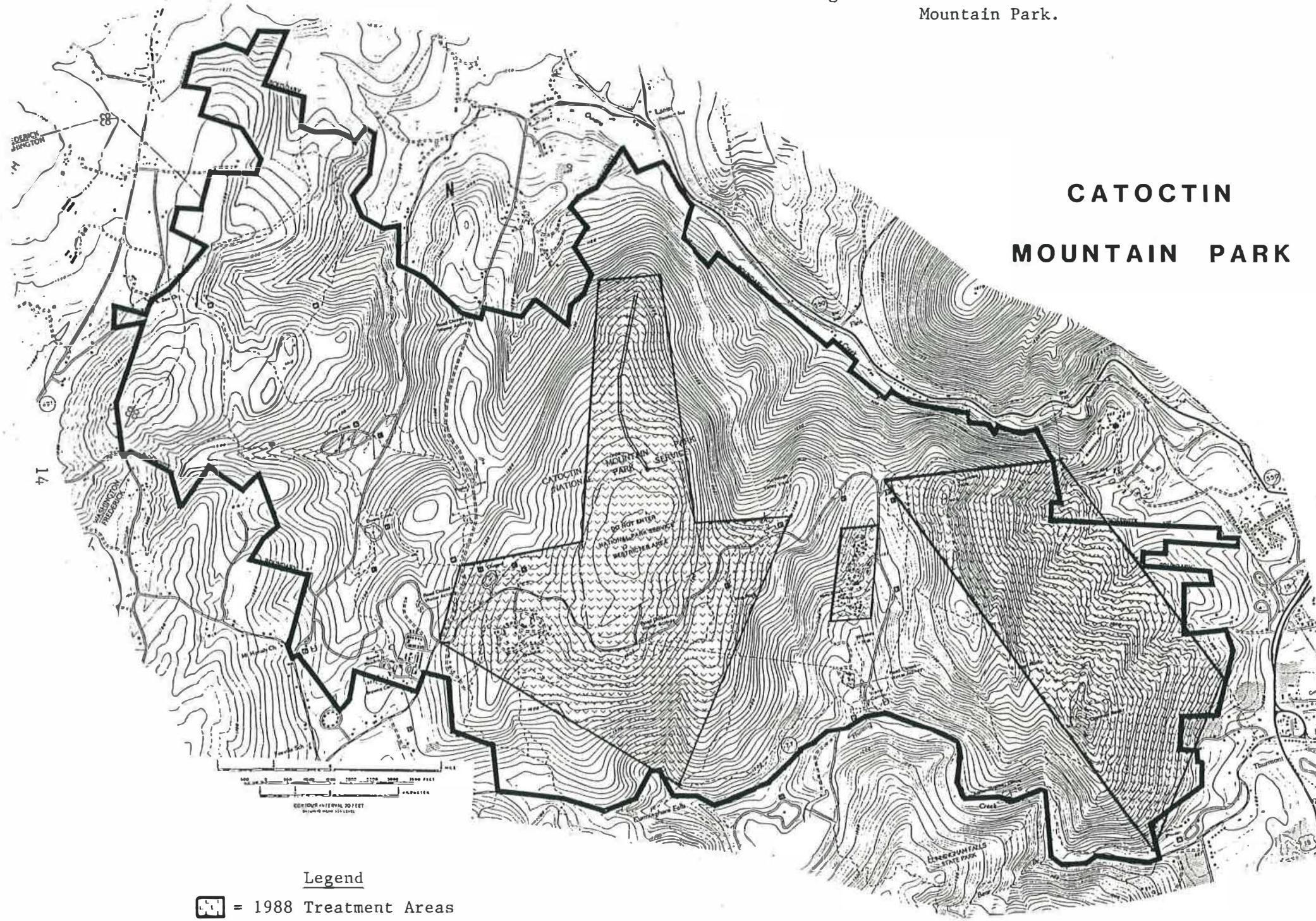


Figure 6.-- Comparison of the percentage of plots within each egg mass density category, 1987 and 1988.

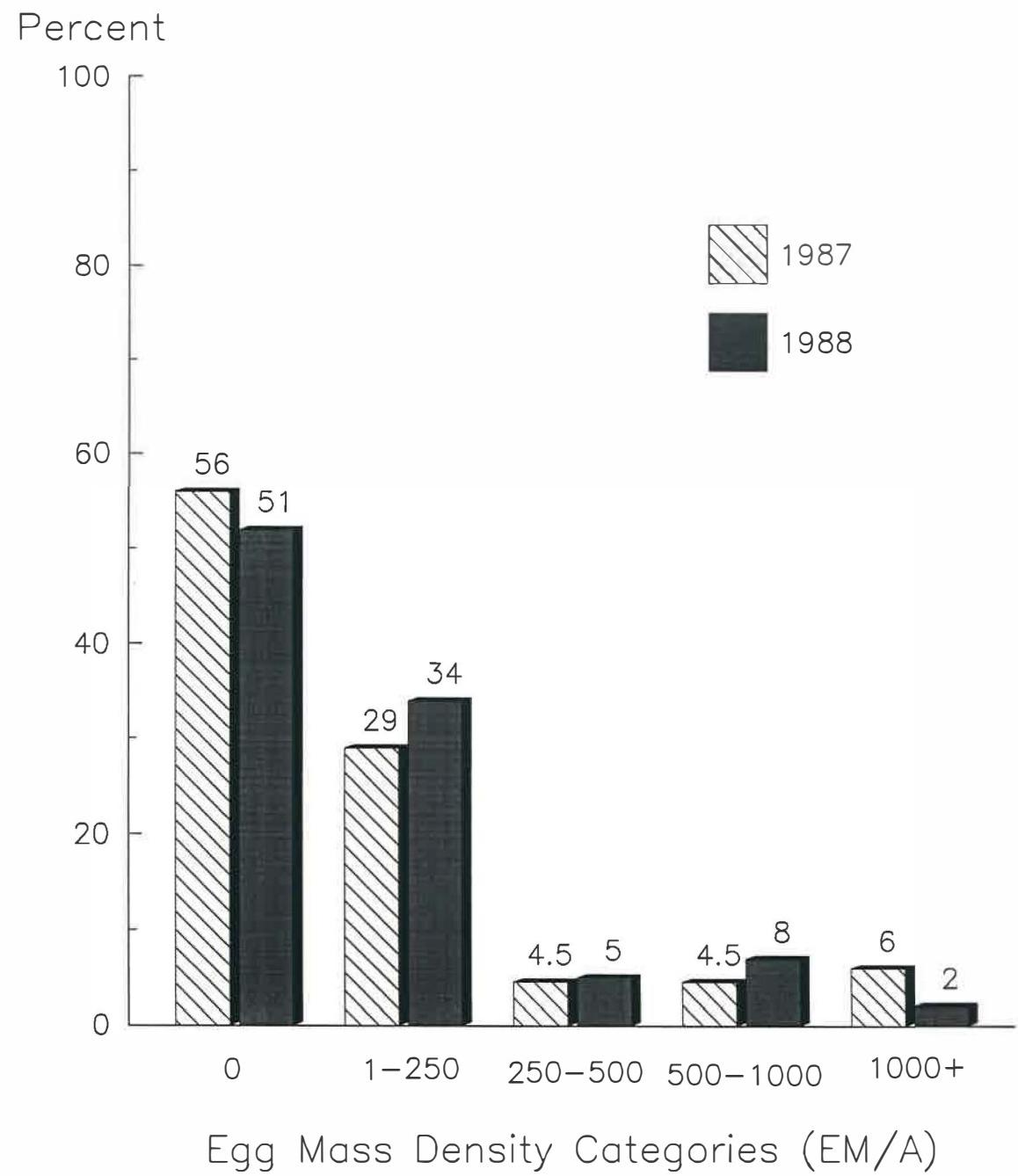


Figure 2.--Pheromone Lure Taping Areas.
Catoctin Mountain Park, 1988 Activities.

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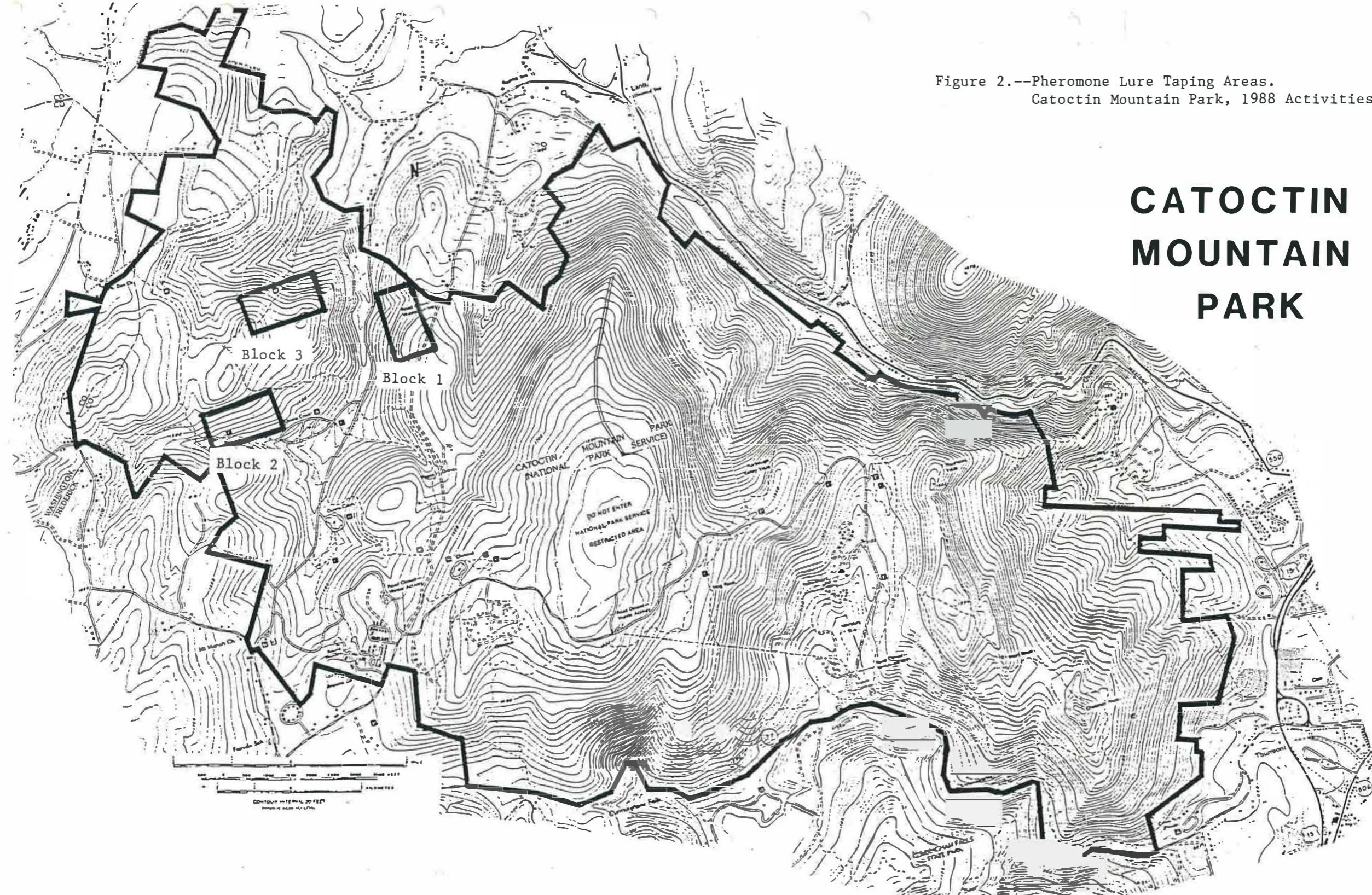
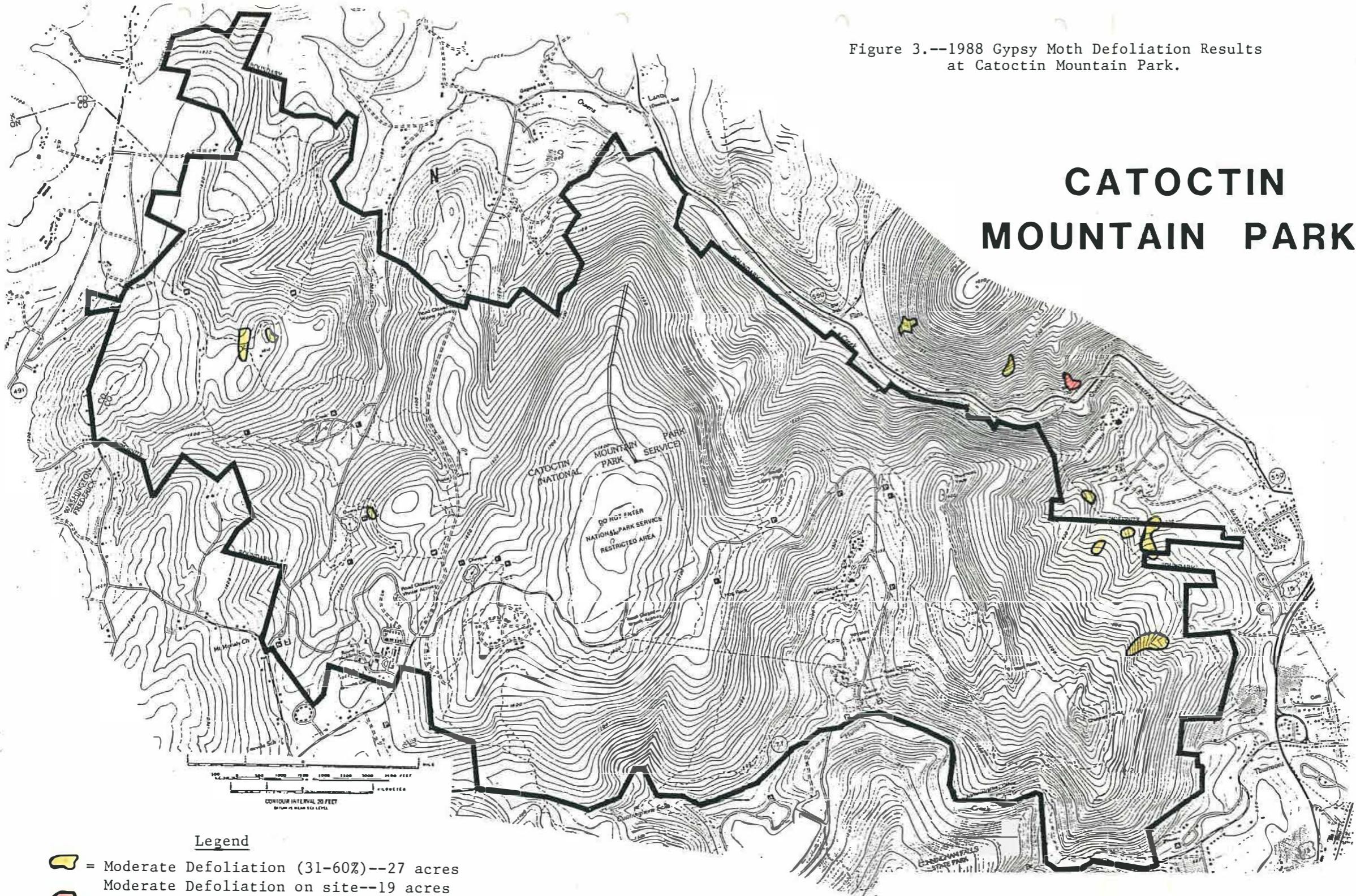


Figure 3.--1988 Gypsy Moth Defoliation Results at Catoctin Mountain Park.

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Legend

- [Yellow-green shaded area] = Moderate Defoliation (31-60%)--27 acres
- [Red shaded area] = Moderate Defoliation on site--19 acres
- [Red heart-shaped area] = Heavy Defoliation (61-100%)--1 acre

Results obtained through the low altitude color infrared photography project, June 25, 1988.

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Figure 4.--Grid Point Locations and Male Moth Catches. 1988 Gypsy Moth Monitoring Activities.

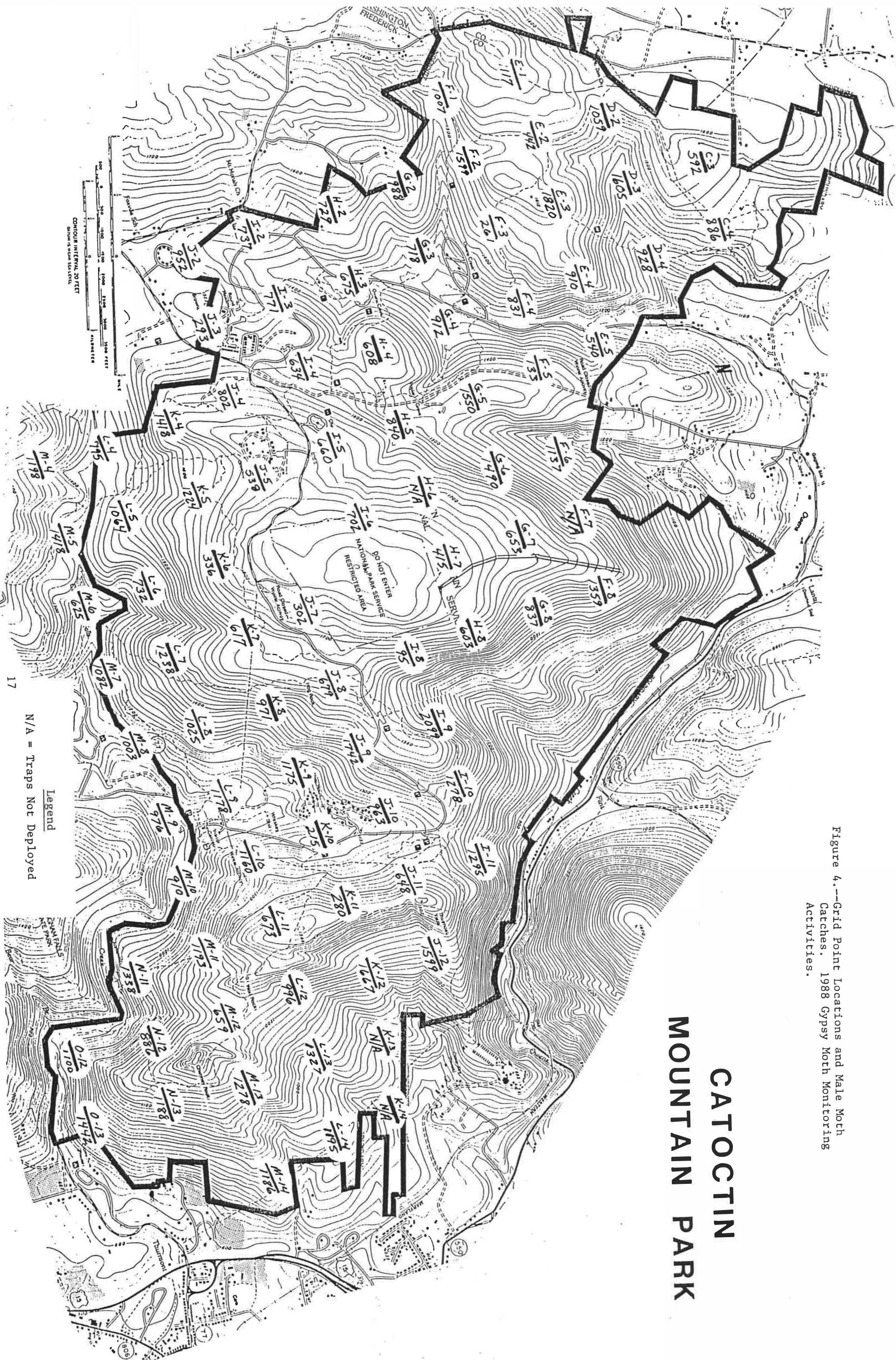


Figure 5.--Number of Egg Masses Per Acre at Each Grid Point and 5-Minute Walk Locations. 1988 Gypsy Moth Monitoring Activities.

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